

Arguments Accompanying Pre-Appeal Brief Request for Review

Submitted below are arguments specifying clear errors in the Examiner's rejections, or the Examiner's omissions of one or more essential elements needed for a *prima facie* rejection.

Claims 1-7, 9, 11-18, 20, 22 and 23

Claims 1-7, 9, 11-18, 20, 22 and 23 have been rejected under 35 USC 103(a) as being unpatentable over Mack et al. (US6462919) in view of Parkin (Phys. Rev. Let., 67(25), 1991, 3598-3601).

Review of the rejections of claims 2-3, 5-6, 11-18, 20 and 23 is respectfully requested.

Applicants respectfully disagree that the combination proposed in the rejection would render the claims obvious.

The analysis of obviousness was set forth in *Graham v. John Deere*, 383 U.S. 1, 148 USPQ 459 (1966). In order to establish a *prima facie* case of obviousness, three basic criteria must be met:

First, there must be some *suggestion or motivation*, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine the teachings of the references. Second, there must be a reasonable *expectation of success*. Finally, the prior art reference or combined references must teach or suggest *all* the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success *must both be found in the prior art*, and not based on applicant's disclosure (*In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991; emphasis added).

Applicants respectfully traverse the rejection of claims 2-3, 5-6, 11-18, 20 and 23 as failing the *Graham* test. Specifically, the combination proposed in the rejection fails at least the first element of the *Graham* test with regards to claims 2-3, 11-18, 20 and 23. The combination proposed in the rejection fails at least the third element of the *Graham* test with regards to claims 5-6.

Regarding claims 5-6 and 16-17, the rejection fails at least the third element of the *Graham* test. To establish *prima facie* obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art. *In re Royka*, 490 F.2d 981, 180 USPQ 580 (CCPA 1974). "All words in a claim must be considered in judging the patentability of that claim against the prior art." *In re Wilson*, 424 F.2d 1382, 1385, 165 USPQ 494, 496 (CCPA 1970).

Claims 5-6 and 16-17 each require a free layer, an AP coupling layer formed above the free layer, a bias layer formed above tab regions of the free layer, and an AP pinned layer structure as recited and positioned below the free layer. The rejection points to col. 8, line 34 to col. 9, line 12 of Mack to show this feature. However, a review of this section indicates only a secondary AP pinned structure formed above the free layer 232, as in Mack Fig. 6B. Nowhere does Mack teach or suggest a free layer, an AP coupling layer formed above the free layer, a bias layer formed above tab regions of the free layer, and an AP pinned layer structure below the free layer. Nor does Parkin does teach or suggest the claimed structure. Accordingly, the rejection fails the third prong of the *Graham* test. Reconsideration and allowance of claims 5-6, 16-17 is respectfully requested.

Regarding the first element of the *Graham* test, Applicants respectfully disagree with the motivation presented in the rejection of claims 2-3, 11-18, 20 and 23. The mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. *In re Mills*, 916 F.2d 680, 16 USPQ2d 1430 (Fed. Cir. 1990). Although a prior art device "may be capable of being modified to run the way the apparatus is

claimed, there must be a suggestion or motivation in the reference to do so." 916 F.2d at 682, 16 USPQ2d at 1432).

Claim 2, 11-18, 20 and 23 require that the AP coupling layer has a thickness of at least about 15Å. Claim 3 requires that the AP coupling layer has a thickness of between about 15 and 25Å. As conceded in the rejection, Mack fails to disclose the claimed thickness. To meet the claim limitations, the Examiner proposes that Parkin suggests not only changing the composition of Parkin's Ru layers 206 but then also changing the disclosed thickness to meet the claimed ranges. Particularly, the rejection indicates that Ir is a known equivalent to other known AP coupling materials, and that it is known in the art that the thickness of AP coupling oscillates, as shown in Parkin's Fig. 2 and Table 1. The rejection goes on to state that because Ir is a known material capable of exhibiting AP coupling, and the concept that AP coupling can occur at a variety of thickness values, it would have been obvious to one of ordinary skill in the art to modify Mack's device to utilize an AP coupling layer meeting the claimed thicknesses.

Applicants respectfully disagree that one skilled in the art viewing both references would be motivated to modify Mack to include an AP coupling layer thickness of at least about 15Å. Applicants first note that Mack clearly indicates that very strong pinning is desired at the end regions 207 of the free layer 208. For example, Mack indicates at col. 8, lines 50-53, that the coupling between the CoFe layers 204 and free layer 208 results in a very large effective H_k in the end regions 207 of free layer 208. The larger H_k in the end regions of the free layer provides for a greater reduction in side reading. See col. 8, lines 26-30. To achieve this high coupling, Mack indicates that the Ru layers 206 are about 10 angstroms thick, as noted in Mack col. 8, lines 58-62.

Looking to Parkin Fig. 2, the oscillatory coupling behavior of the spacer layer materials decreases with increasing thickness, from a peak around 10 angstroms. Thus, by the very nature of the oscillatory coupling behavior of the spacer layer, as shown in Parkin's Fig. 2, increasing the thickness of Mack's Ru layer would result in decreased coupling of the end regions of Mack's free layer. Therefore, it cannot be said that one

skilled in the art viewing both Mack and Parkin at the time of invention would have been motivated to make Mack's Ru layer 206 thicker, thereby reducing the pinning of the end regions of the free layer. Accordingly, it cannot be said that the prior art suggests the desirability of the combination, as required by the rule of *In re Mills*, *supra*.

Reconsideration and allowance of claims 2-3, 11-18, 20 and 23 is respectfully requested.

Applicants also argue that Mack teaches away from using a thicker spacer layer, as recited in claims 2-3, 11-18, 20 and 23. A *prima facie* case of obviousness may also be rebutted by showing that the art, in any material respect, teaches away from the claimed invention. *In re Geisler*, 116 F.3d 1465, 1471, 43 USPQ2d 1362, 1366 (Fed. Cir. 1997). In the instant case, Mack indicates that a "very large effective Hk in the end regions 207 of free layer 208" is desirable. See Mack col. 8, lines 50-53. Mack also indicates that "[a] major difficulty in manufacturing sensors with exchange tabs ... is establishing adequate exchange coupling between the exchange tabs and free layer." See Mack col. 3, lines 35-38. Parkin Fig. 2, on the other hand, shows that increasing the thickness of the spacer layer dramatically decreases the resulting saturation field of the stack. Thus, Mack appears to teach away from using a thicker spacing layer as proposed in the rejection.

Reconsideration and allowance of claims 2-3, 11-18, 20 and 23 is respectfully requested.

Claims 8, 10, 19 and 21

Claims 8, 10, 19 and 21 have been rejected under 35 USC 103(a) as being unpatentable over Mack in view of Parkin and in yet further view of Fuke.

Regarding claims 8 and 19, claims 8 and 19 have each been previously amended to require that the free layer is formed directly on a layer of NiFe. This limitation is not found in Mack, Parkin or Fuke. Reconsideration and allowance of claims 8 and 19 is respectfully requested.

Claims 10 and 21 depend from claims 1 and 11, respectively, and therefore incorporate the limitations of claims 1 and 11. Claims 1 and 11 are believed to be allowable over Mack and Parkin, as discussed in detail above. Accordingly, because Fuke has merely been added to show fcc CoFe, claims 10 and 21 are believed to be allowable over the proposed combination of art.